SUMMARY POINTS:

Understanding Electricity in Montana

A Guide to Electricity, Natural Gas and Coal Produced and Consumed in Montana

These lists of points summarize the guide prepared for the Environmental Quality Council. They cover the status of electricity, natural gas and coal supply and demand in Montana and the Montana electric transmission grid. The reader is advised to consult the guide itself for detailed explanations of technical points and to see the data tables that underpin these summaries.

SUMMARY

Electricity Supply and Demand in Montana

Montana generates more electricity than it consumes. Montana generating plants have the capacity to produce 5,200 MW of electricity. An annual average of 3,200 aMW (1 aMW=8,760 MWh) was produced in the period 1995-1999. During that time, Montana consumption accounted for slightly more than half of production, with Montana sales and transmission losses equaling about 1,800 aMW in 2000. (p. I-1)

Montana straddles the two major electric interconnections in the country. Most of Montana is in the western interconnection, which covers all or most of 11 states, two Canadian provinces and a bit of northern Mexico. Only about 5 percent of Montana's load is in the eastern interconnection, along with less than 1 percent of the electricity generated in-state. (p. I-2)

Montana is a small player in the western electricity market. The 1999 Montana load (sales plus transmission losses) was equivalent to about 2 percent of 86,122 aMW load in the entire western interconnection. Montana generation accounted for less than 4 percent of total west generation that year. (p. I-2)

There are 45 electric generating facilities in Montana. The largest are the four privately owned coal-fired plants at Colstrip, which have a combined capability of 2,094 MW. The largest hydroelectric plant is U.S. Corps of Engineers' Libby Dam with a capability of 600 MW. (p. I-2)

The only electric generation plants of any size coming on line in the 1990's were two non-utility qualifying facilities (QFs): Montana One waste coal plant (41.5 MW) and BGI petroleum coke-fired plant (65 MW). These two combined now account for about 92 percent of the electricity output of QFs in Montana. (p. I-2)

PPL Montana's facilities, previously owned by Montana Power Company, produced the largest amount of electricity on average in 1995-1999, with about 30 percent of the total generated in Montana. Puget Power was the second largest producer with 16 percent. Federal agencies—Bonneville Power Administration and Western Area Power Administration—collectively produced 22 percent of the electricity generated in Montana. (p. I-3)

Montana generation is powered almost entirely by coal (54 percent) and hydro (44 percent) (1995-1999 average). Until 1985, hydro was the dominant source of net electric generation in Montana. Over the last 15 years, about 25 percent of Montana coal production has gone to generate electricity in Montana. (p. I-3)

Montanans are served by 38 distribution utilities: 4 investor-owned, 30 rural electric cooperatives, 3 federal agencies and 1 municipal. (Four of the co-ops serve only a handful of Montanans.) (p. I-4)

In 2000, investor-owned utilities made up 45 percent of the electricity sales in Montana, co-ops 25 percent, federal agencies 16 percent and power marketers 14 percent. (p. I-4)

Montana sales in 2000 were 14.5 billion kWh. Sales have tripled since 1960. Growth was faster in the first half of that period than in the latter. Since 1990, sales to the commercial sector have grown the most, followed by the residential sector. During the 1990-2000 decade, residential consumption rose at an average annual rate of 1.5 percent, commercial at 3.4 percent and the overall growth rate was 1.0 percent statewide. Industrial sales have bounced around, but on the whole haven't increased much. The impact of the 2000-2001 price spike doesn't appear in these data, but the spike did significantly and permanently reduce industrial consumption. (p. I-5)

The consumer cost of electricity didn't change much during the 1990's. Throughout that decade, as in previous decades, electricity in Montana cost less than the national average. In 2000, Montana averaged 4.74 cents/kWh vs. 6.78 cents/kWh for the U.S. as a whole. On average, the rates of cooperatives and private utilities were about the same in 2000; however, that average masks considerable variation. (p. I-5)

As electricity prices go up, growth in consumption should slow. Only about one-quarter of the Montana load had seen significantly higher prices by the start of 2002. The entire impact on consumption of changes in the regional electricity market has yet to hit. (p. I-6)

There are no statewide forecasts for future electricity consumption. For a number of reasons, slower growth than in the past decade seems likely. Scenarios of future growth suggest that a statewide increase of 260 aMW would be an optimistic estimate. A lesser amount of net growth would be more likely and a loss of statewide load at least a possibility. (p. I-8)

While these are only scenarios, and not predictions, the range does suggest minimal need for net additions of generation resources to serve increases in Montana loads. (p. I-8)

Cost-effective energy efficiency improvements plausibly could meet much or all of the net increase in statewide load over the next decade. (p. I-9)

There are no comprehensive estimates of the potential for efficiency improvements. However, it is reasonable to assume potential reductions are in a range around 10 percent. (p. I-9)

During the electricity crisis of 2000-2001, the Pacific Northwest ultimately reduced its demand by around 20 percent. Most of that came from business suspensions, primarily in response to payments from their electricity providers. This reduction would not be advisable or cost-effective under normal conditions, but does indicate the ability of consumers to change their usage in the face of higher prices, either in terms of what they pay or what they're offered to forego using electricity. (p.I-10)

SUMMARY

The Montana Electric Transmission Grid: Operation, Congestion and Issues

- Montana's strongest electrical interconnections with other regions are: the Colstrip 500 kV line which connects as far as Spokane and then into the BPA northwest grid; the BPA 230 kV lines heading west from Hot Springs; PacifiCorp's interconnection from Yellowtail south to Wyoming; WAPA's DC tie to the east at Miles City; and the AMPS line running south from Anaconda parallel to the Grace line to Idaho. (p. II-1)

- The western United States is a single, interconnected and synchronous electric system. It is not closely connected with the eastern part of the country. Because there would be massive instantaneous flows across any direct connection, the interconnections are only weakly tied to each other with AC/DC/AC converter stations. One such station connecting the eastern and western grids is located at Miles City. It is capable of transferring up to 200 MW in either direction. Depending on transmission constraints, a limited amount of additional power can be moved from one grid to the other by shifting units at Fort Peck Dam. (p. II-2)

- The transmission system is managed differently than the way it operates physically. (p. II-3)

- The physical reality of electricity (electrons) is that power sent from one point to another flows over all transmission lines in the interconnected system. Actual flows at any time are the net result of all transactions, and are the same for any given pattern of generation and load, regardless of transactions. (p. II-3)

- Management of the grid is different from where the electricity actually flows. Grid management requires a single "contract path" for each scheduled transaction. A "contract path" is permission to use a route across separately owned transmission systems from a point to origin to a point of delivery. It does not have to be the major route taken by the actual power flows that occur (which could happen over multiple routes). (p. II-4)

- Power flows are managed on a limited number of "rated paths." Each path consists of a number of more-or-less parallel transmission lines that together can be constrained under some patterns of generation and loads. (p. II-6)

- Path ratings are set to provide reliability by ensuring sufficient redundant capacity to allow for outages of some of the facilities comprising the path. Path ratings may be reduced if reliability standards are tightened. The West of Hatwai path currently has a rating of 2800

MW east to west and 600 MW west to east. The Montana-Northwest path has a rating of 2200 MW east to west and 600 MW west to east. (p. II-6)

Schedules are only accepted up to the limit of rated capacity. Netting of schedules is allowed only for a single scheduler. Netting against other's schedules is not allowed. (p. II-4)

Scheduling rights across rated paths are generally owned by the transmission owners and holders of long term contracts for power delivery. (p. II-7)

In 1996, FERC ordered transmission owners to separate marketing and transmission operations, to maintain web sites on which "available capacity" is posted and offered for use by others. "Available capacity" is total transfer capacity less committed uses and existing contracts. Almost no available capacity ever is listed on paths from Montana to the West Coast. (p. II-7)

Non-firm access is available on uncongested paths but only at the last minute. (p. II-7)

A path may be fully scheduled, and therefore congested, even though the actual flow may be considerably less than the path capacity. For example the West of Hatwai path was deemed congested and some schedules had to be rejected 8 percent of the time during a period in which the path was never actually loaded more than about 90 percent of capacity. (p. II-8)

Negotiations are underway, and applications have been filed with FERC, to form independent organizations ("Regional Transmission Organizations" or RTOs) to operate and manage the transmission grid. Montana would be part of RTO West. (p. II-8)

RTO management would allow for regional management of path congestion and scheduling for better utilization and availability of the transfer capacity of the grid. (p. II-9)

Issues involved in the amount and availability of capacity include the need of utilities to withhold capacity because of uncertainty, the way reliability criteria are set, the limited number of hours that transmission paths are congested, and the challenges and costs of siting and building new transmission lines. (p. II-9)

The Western Governors' Association recently sponsored two studies on transmission. One looks at the need for new transmission in the west under two scenarios of resource development. The second report considers alternate ways to encourage and finance the construction of needed investments in new transmission capacity. (p. II-12)

SUMMARY

Natural Gas in Montana: Current Trends, Forecasts and the Connection with Electric Generation

Montana obtains the largest portion of its natural gas from Alberta and will continue to do so in the near future. Montana produces about as much gas as it consumes, but exports most of this to the Dakotas and the U.S. Midwest. (p. III-1)

The delivered price of natural gas to our homes and businesses includes the wellhead price of gas (price of the gas itself out of the ground), plus transmission and delivery fees, plus other miscellaneous charges. Wellhead prices are set in a continent-wide market. The natural gas transmission and delivery fees are set by utilities and/or pipelines, under regulation by state and federal agencies. (p. III-7)

Congress started the deregulation of the U.S. market in 1978. (p. III-7)

The wellhead price of natural gas for Montana and the Pacific Northwest is set mainly in Alberta. Albert prices follow the AECOC Index, which in turn follows the major U.S. gas indices. Alberta's price tends to run about $.30/Mcf lower than average U.S. prices due to its geographic location. (p. III-8)

Average wellhead prices nationwide are expected by the U.S. Department of Energy to increase about 3 percent annually in the next 20 years. They are expected to average $2.04/Mcf in 2002 and $3.20-$3.70/Mcf in 2020 using current dollars. The actual U.S. wellhead price in 2002 so far has been in the $2.50-$3.00/Mcf range, although the price was as high as $3.80/Mcf in early May, 2002. It is important to note that gas prices and energy prices in general can fluctuate widely at any given time. (p. III-8)

Average delivered natural gas prices for the U.S., which include wellhead price plus transmission and delivery fees, are forecast to increase slowly over the next 20 years at about 0.5 percent per year. According to the U.S. Department of Energy, delivered residential prices in Montana will likely remain below those elsewhere in the U.S. due to relatively low transmission costs. Montana households can expect to pay around $5.00-$5.50/Mcf through 2010 (in current dollars) while the average U.S. residence can expect to pay $6.00-$7.00/Mcf. (p. III-9)

NorthWestern Energy (NWE; previously Montana Power Company) provides natural gas transmission and distribution services to 151,000 customers in the western two-thirds of the state. Both its transmission and distribution businesses are regulated by the Montana Public Service Commission. (p. III-5)

- NWE currently has access to relatively cheap Alberta gas as a condition of the transition to a deregulated retail market. As of July 1, 2002, NWE core customers may have to pay gas prices closer to national prices. (p. III-9)

- Montana-Dakota Utilities (MDU) is Montana's second largest natural gas utility, distributing natural gas in the eastern third of the state, from Billings to the Dakotas. MDU uses the Williston Basin Interstate/Warren transmission line, which is regulated by FERC, to move its purchased gas. Most of MDU's purchased gas is domestic, with about 50 percent coming from Wyoming; only about 10 percent comes from Canada. (p. III-6)

- Energy West (formerly Great Falls Gas Co.) is the third largest gas distributor in Montana, serving the Great Falls area. Other small companies serve a few rural towns. (p. III-7)

- Recent Montana natural gas consumption has been around 60 billion cubic feet (bcf) per year. Average Montana gas consumption is expected to increase slowly at less than 1 percent annually according to utility projections. (p. III-3)

- The prediction of slow growth does not include gas consumed by the proposed Silver-Bow electrical generation plant or the Montana First Megawatts plant in Great Falls, currently under construction. The Silver Bow plant alone would boost Montana gas consumption by 50 percent. Though these plants would each significantly increase total Montana natural gas consumption, they would not significantly affect gas prices. (p. III-3 and 4)

- Although gas prices are expected to increase slowly, Montana may be subject to increasing price volatility from extreme events such as the California energy crisis of 2000-2001. Increased pipeline capacity from Alberta out to the U.S. Midwest and U.S. East Coast means that the wellhead price paid in Montana today is more closely tied than ever to prices paid nationwide and to unexpected, nationwide events that can affect prices. Further, there is an increased use of natural gas nationwide for electricity generation, which has led wholesale electric and natural gas prices to become intimately tied together. Increasing convergence of the electricity and natural gas markets means that extreme events like the California energy crisis are likely to affect both markets simultaneously. (p. III-10)

SUMMARY

Coal in Montana

Montana is the sixth largest producer of coal in the United States, with over 38 million tons mined in 2000. Almost all the mining occurs in the Powder River Basin south and east of Billings. (p. IV-1)

In 1958, after almost a century of mining, Montana production bottomed at 305,000 tons, an amount equivalent to less than 1 percent of current output. As Montana mines began supplying electric generating plants in Montana and the Midwest in the late 1960's, coal production jumped. Production in 1969 was 1 million tons; ten years later, it was 32.7 million tons. Since the end of the 1970's, production has increased gradually to around 40 million tons. (p. IV-1)

Over the past decade Montana has produced a little less than 4 percent of the coal mined each year in the U.S., more or less maintaining its share of the national market. In comparison most eastern states lost market share during this decade, primarily to Wyoming. Western states other than Wyoming followed a path similar to Montana, more or less maintaining market share. (p. IV-2)

The price of Montana coal averaged $8.87 per ton at the mine in 2000, including taxes and royalties. The price of coal has been on a downward trend since the early 1980's, when the average price of coal peaked at $14.22 per ton ($22.10 in 2000 dollars). By 2000 that price had fallen 60 percent in real terms. The decline in Montana prices mirrors the decline in prices nationally. (p. IV-2)

In 2000 about 60 percent of Montana coal came from federal lands and under 20 percent from reservation lands. (p. IV-3)

Montana had seven coal mines in operation in 2001. The largest were Westmoreland's Rosebud Mine at Colstrip and Kennecott Energy's Spring Creek Mine near Decker, each producing around 10 million tons per year. No major new mines have opened since 1980, though the West Decker and Spring Creek mines have expanded significantly. (p. IV-3)

Westmoreland is the largest producer in Montana, accounting for 44 percent of 2001 production. Kennecott is the second largest, accounting for 25 percent of coal production outright and holding a half-interest in mines producing an additional 24 percent of Montana coal. (p. IV-3)

2001 marked the passing of an era in Montana coalfields, as over 40 years of utility ownership of operating coalfields in Montana came to an end. Utility-owned production had been substantial in past years. (p. IV-3)

- About 95 percent of the coal consumed in Montana is used to generate electricity. Montana coal consumption has been more or less stable since the late 1980's, after Colstrip 4 came on line. (p. IV-3)

- Almost all of Montana coal production is used to generate electricity. In recent years, about 74 percent has been shipped by rail to out-of-state utilities, about 9 percent has been burned to produce electricity for in-state customers and about 15 percent had been burned to produce electricity and shipped by wire to out-of-state utilities. (p. IV-4)

- Over the last decade, Michigan, Minnesota and Montana have each taken about a quarter of all the coal produced in Montana. The rest has gone to numerous other states. (p. IV-4)

- The Montana industry, like the coal industry nationwide, has become more productive, with the number of employees dropping even while the amount of coal mined increased. (p. IV-4)

- Taxes on coal, despite decreases from historical highs, remain a major source of revenue for Montana, with $32.3 million collected in state fiscal year 2001, about one-third in nominal terms the amount collected in 1984. Coal severance tax collections dropped due to changes in the tax laws that began with the 1987 Legislature and due to the declining price of coal. Production has risen modestly since the cut in taxes. (p. IV-4)

- Montana's output is dwarfed by Wyoming's, which produced 31.6 percent of the country's output in 2000. This is nine times as much coal as Montana produced. This is due to a combination of geologic, geographic and economic factors that tend to make Montana coal less attractive than coal from Wyoming. (p. IV-5)